Assignment 10.3 Step 2 of Final Project

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Data Preparation for Exploratory Data Analysis

```r
setwd("C:\\Users\\atanu\\Documents\\BellevueUniversity_MSDS\\DSC520\\Loan Defaulter Data")
default_fin <- read.csv("Default_Fin.csv")
head(default_fin)
```

```
##   Index Employed Bank.Balance Annual.Salary Defaulted.
## 1     1        1      8754.36     532339.56          0
## 2     2        0      9806.16     145273.56          0
## 3     3        1     12882.60     381205.68          0
## 4     4        1      6351.00     428453.88          0
## 5     5        1      9427.92     461562.00          0
## 6     6        0     11035.08      89898.72          0
```

This data is related to defaulters, this gives individual's information like if the applicant is employed or not, their bank balance annual salary and if the application defaulted.

```r
setwd("C:\\Users\\atanu\\Documents\\BellevueUniversity_MSDS\\DSC520\\Loan Defaulter Data")
loan_data <- read.csv("loan_data.csv")
summary(loan_data)
```

```
##  credit.policy     purpose             int.rate       installment    
##  Min.   :0.000   Length:9578        Min.   :0.0600   Min.   : 15.67  
##  1st Qu.:1.000   Class :character   1st Qu.:0.1039   1st Qu.:163.77  
##  Median :1.000   Mode  :character   Median :0.1221   Median :268.95  
##  Mean   :0.805                      Mean   :0.1226   Mean   :319.09  
##  3rd Qu.:1.000                      3rd Qu.:0.1407   3rd Qu.:432.76  
##  Max.   :1.000                      Max.   :0.2164   Max.   :940.14  
##  log.annual.inc        dti              fico       days.with.cr.line
##  Min.   : 7.548   Min.   : 0.000   Min.   :612.0   Min.   :  179    
##  1st Qu.:10.558   1st Qu.: 7.213   1st Qu.:682.0   1st Qu.: 2820    
##  Median :10.929   Median :12.665   Median :707.0   Median : 4140    
##  Mean   :10.932   Mean   :12.607   Mean   :710.8   Mean   : 4561    
##  3rd Qu.:11.291   3rd Qu.:17.950   3rd Qu.:737.0   3rd Qu.: 5730    
##  Max.   :14.528   Max.   :29.960   Max.   :827.0   Max.   :17640    
##    revol.bal         revol.util    inq.last.6mths    delinq.2yrs    
##  Min.   :      0   Min.   :  0.0   Min.   : 0.000   Min.   : 0.0000  
##  1st Qu.:   3187   1st Qu.: 22.6   1st Qu.: 0.000   1st Qu.: 0.0000
##  Median :   8596   Median : 46.3   Median : 1.000   Median : 0.0000
##  Mean   :  16914   Mean   : 46.8   Mean   : 1.577   Mean   : 0.1637
##  3rd Qu.:  18250   3rd Qu.: 70.9   3rd Qu.: 2.000   3rd Qu.: 0.0000
##  Max.   :1207359   Max.   :119.0   Max.   :33.000   Max.   :13.0000
##     pub.rec          not.fully.paid
##  Min.   :0.00000   Min.   :0.0000
##  1st Qu.:0.00000   1st Qu.:0.0000
##  Median :0.00000   Median :0.0000
##  Mean   :0.06212   Mean   :0.1601
##  3rd Qu.:0.00000   3rd Qu.:0.0000
##  Max.   :5.00000   Max.   :1.0000
```

This dataset gives the loan details like the interest rate, fico of the customer, type of the loan, annual income along with fully paid or not flag.

```
setwd("C:\\Users\\atanu\\Documents\\BellevueUniversity_MSDS\\DSC520\\Loan Defaulter Data")
application_data <- read.csv("application_data.csv")
```

This data set is about loan application where Target field having 1 means the applicant have difficulty while paying for the loan and also have more than x day late payment.

Below are the list of Questions, that we are planning to answer using this data.

1. What attributes affect loan default and what are some major reasons behind it?

2. Is there any co-realation between different attributes of loan default data and gereral loan data?

3. I think, Income having a direct effect on loan default, because low income could cause default for loan payment. is it true?

4. Can I predict if the loan will go to default if I have employment, annual salary and bank balance information?

5. Does high fico socre give lower interest retes for loan?.

```
library(naniar)
miss_var_summary(default_fin)
```

```
## # A tibble: 5 x 3
##   variable      n_miss pct_miss
##   <chr>          <int>    <dbl>
## 1 Index              0        0
## 2 Employed           0        0
## 3 Bank.Balance       0        0
## 4 Annual.Salary      0        0
## 5 Defaulted.         0        0
```

```
miss_var_summary(loan_data)
```

```
## # A tibble: 14 x 3
##    variable          n_miss pct_miss
##    <chr>              <int>    <dbl>
##  1 credit.policy          0        0
##  2 purpose                0        0
##  3 int.rate               0        0
##  4 installment            0        0
##  5 log.annual.inc         0        0
##  6 dti                    0        0
##  7 fico                   0        0
##  8 days.with.cr.line      0        0
##  9 revol.bal              0        0
## 10 revol.util             0        0
## 11 inq.last.6mths         0        0
## 12 delinq.2yrs            0        0
## 13 pub.rec                0        0
## 14 not.fully.paid         0        0
```

```
miss_var_summary(application_data)
```

```
## # A tibble: 122 x 3
##    variable                 n_miss pct_miss
##    <chr>                     <int>    <dbl>
##  1 COMMONAREA_AVG           214865     69.9
##  2 COMMONAREA_MODE          214865     69.9
##  3 COMMONAREA_MEDI          214865     69.9
##  4 NONLIVINGAPARTMENTS_AVG  213514     69.4
##  5 NONLIVINGAPARTMENTS_MODE 213514     69.4
##  6 NONLIVINGAPARTMENTS_MEDI 213514     69.4
##  7 LIVINGAPARTMENTS_AVG     210199     68.4
##  8 LIVINGAPARTMENTS_MODE    210199     68.4
##  9 LIVINGAPARTMENTS_MEDI    210199     68.4
## 10 FLOORSMIN_AVG            208642     67.8
## # ... with 112 more rows
```

application_data have sereral missing values so lets eleminate those columns which have more than 10% missing values.

```
application_data <- application_data[ lapply( application_data,
                                              function(x) sum(is.na(x)) / length(x) ) < 0.1 ]
miss_var_summary(application_data)
```

```
## # A tibble: 70 x 3
##    variable                 n_miss pct_miss
##    <chr>                     <int>    <dbl>
##  1 OBS_30_CNT_SOCIAL_CIRCLE   1021 0.332
##  2 DEF_30_CNT_SOCIAL_CIRCLE   1021 0.332
##  3 OBS_60_CNT_SOCIAL_CIRCLE   1021 0.332
##  4 DEF_60_CNT_SOCIAL_CIRCLE   1021 0.332
##  5 EXT_SOURCE_2                660 0.215
##  6 AMT_GOODS_PRICE             278 0.0904
##  7 AMT_ANNUITY                  12 0.00390
##  8 CNT_FAM_MEMBERS               2 0.000650
##  9 DAYS_LAST_PHONE_CHANGE        1 0.000325
## 10 SK_ID_CURR                    0 0
## # ... with 60 more rows
```

lets eleminate the records that have missing values using the below command.

```
library(tidyr)
application_data <- na.omit(application_data)
miss_var_summary(application_data)
```

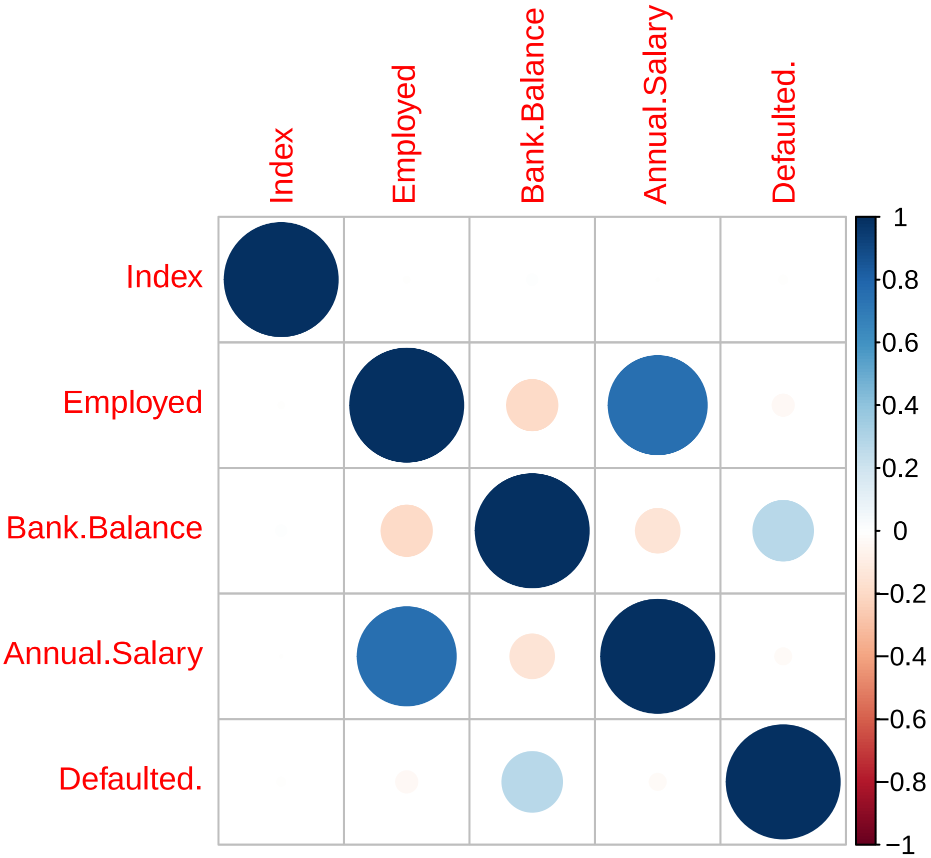
```
## # A tibble: 70 x 3
##    variable           n_miss pct_miss
##    <chr>               <int>    <dbl>
##  1 SK_ID_CURR              0        0
##  2 TARGET                  0        0
##  3 NAME_CONTRACT_TYPE      0        0
##  4 CODE_GENDER             0        0
##  5 FLAG_OWN_CAR            0        0
##  6 FLAG_OWN_REALTY         0        0
##  7 CNT_CHILDREN            0        0
##  8 AMT_INCOME_TOTAL        0        0
##  9 AMT_CREDIT              0        0
## 10 AMT_ANNUITY             0        0
## # ... with 60 more rows
```

as missing data has been removed from the dataframe we can start analysis. I am using the corrplot to see the correlation matrix.

```
library(corrplot)
```

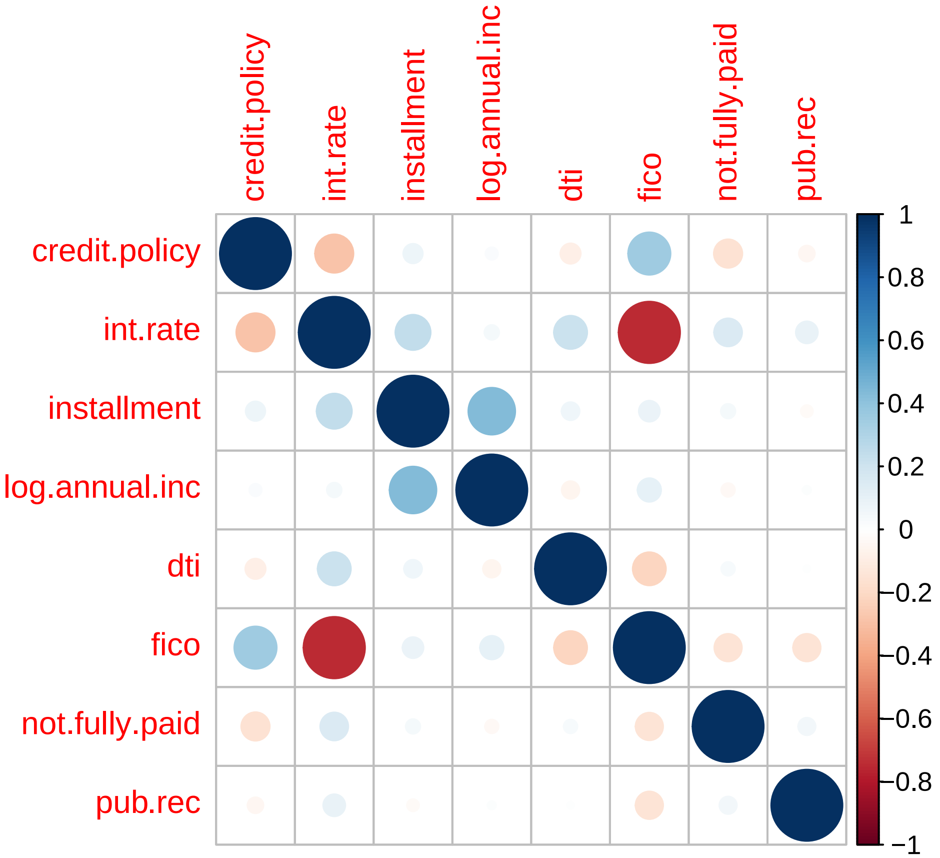
```
## corrplot 0.92 loaded
```

```
corrplot(cor(default_fin, method = c("spearman")))
```



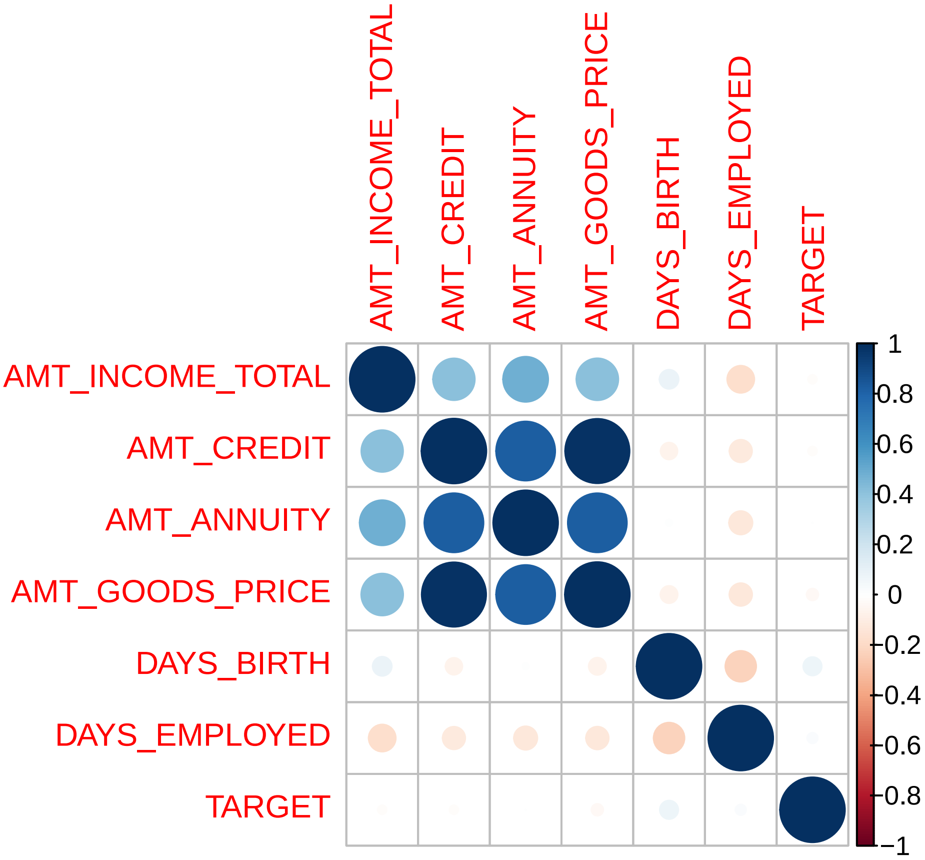
### Looking at the correlation color matrix we can say that defaulters are highly correlated with bank balance.

```
library(corrplot)
corrplot(cor(loan_data[c('credit.policy','int.rate','installment','log.annual.inc','dti','fico','not.fu
```



### From the correlation matrix above there represents the correlation visually, shows not of the attributes have affect on not.fully.paid i.e. defualter.

```
library(corrplot)
corrplot(cor(application_data[c('AMT_INCOME_TOTAL','AMT_CREDIT','AMT_ANNUITY','AMT_GOODS_PRICE','DAYS_B
```



### none of the attributes selected have direct affect on Target fields.

For further steps I will analyze income and loan defaulter to some insight.

Also I am planning to fit a logistic regression model on defaulter as dependent variable and employment, annual salary and bank-balance as independent variables.

I will also do some further analysis on fico and interest rate.